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Title: OPTICAL SWITCH HAVING ROTATABLE REFLECTOR ;

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ABSTRACT:

An optical switch has a light reflecting surface 1, means 2 for rotating the light reflecting surface about an axis through the plane ofthe surface (3 Figure 2) and a plurality of fibre optics 5 located around the light reflecting surface whereby rotation of the light reflecting surface enables switching of a light source between one or more fibre optics. The light reflecting surface may be planar mirror. The rotating means may be an electric motor. A light source or detector 6 is shown.

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(56) Documents cited

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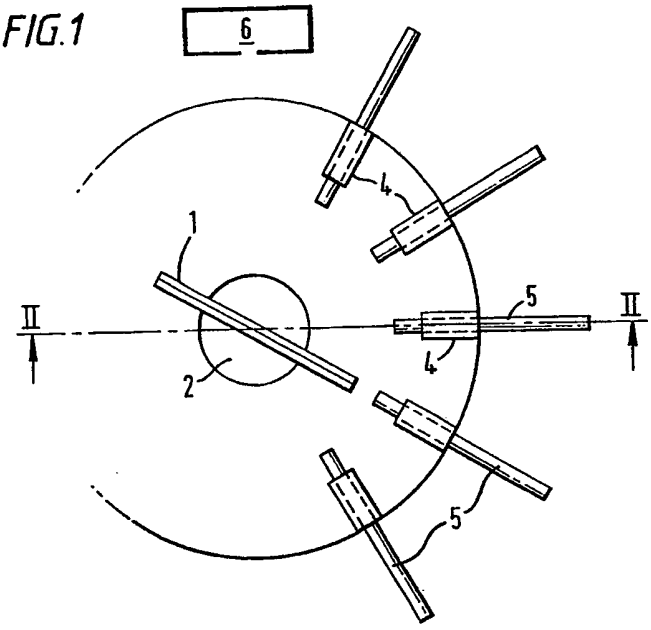
G2J
Selected US specifications from IPC sub-class G02B

(54) Optical switch having rotatable reflector

(57) An optical switch has a light reflecting surface 1, means 2 for rotating the light reflecting surface about an axis through the plane of the surface (3 Figure 2) and a plurality of fibre optics 5 located around the light reflecting surface whereby rotation of the light reflecting surface enables switching of a light source between one or more fibre optics. The light reflecting surface may be planar mirror. The rotating means may be an electric motor. A light source or detector 6 is shown.

FIG.1



GB 2 178 869 A

FIG.1

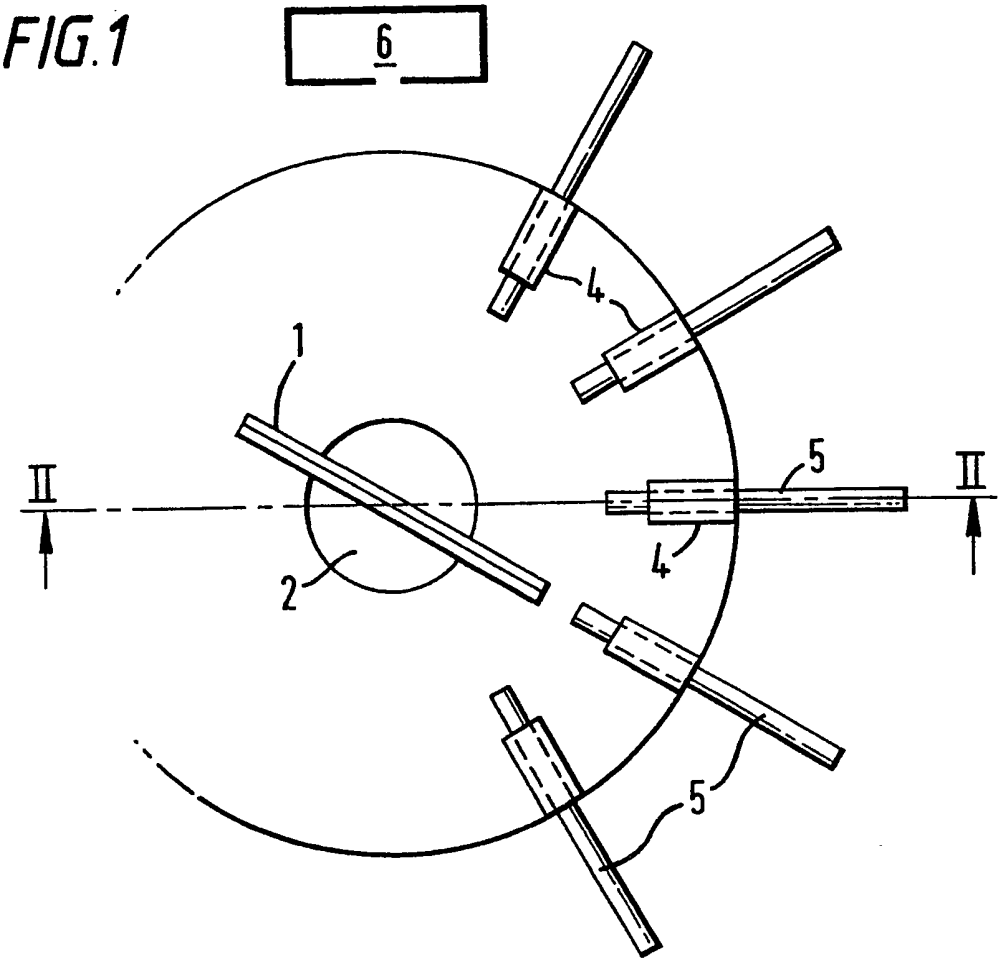
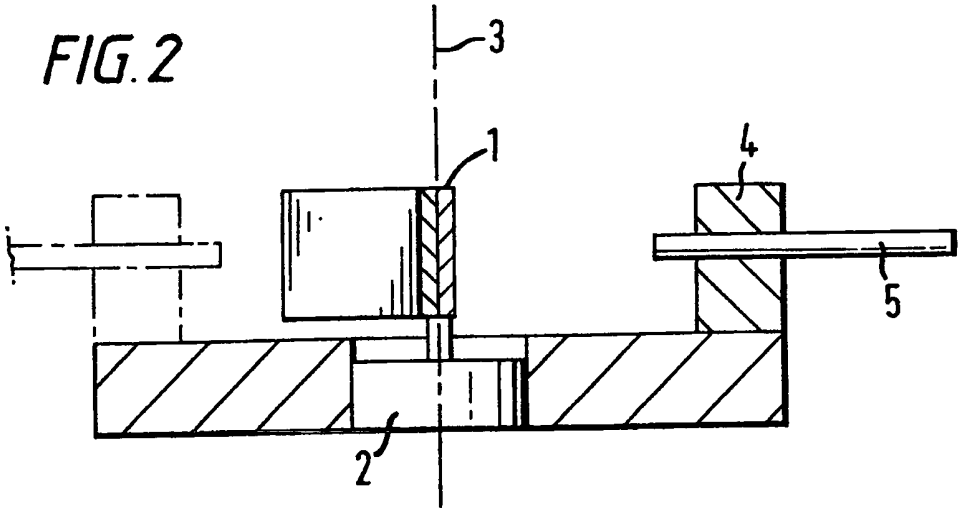


FIG.2



SPECIFICATION

Optical switch

The present invention relates to an optical switch for use in fibre optics systems.

It is known to use fibre optics to make photometric measurements on remote samples. For economic reasons, it is advantageous to use a single source and/or detector for a plurality of optical sensors. In order to make this possible an optical switch is required. The present invention relates to an improved optical switch which has a relatively simple design.

Thus according to the present invention there is provided an optical switch comprising a light reflecting surface, means for rotating the light reflecting surface about an axis through the plane of the surface and a plurality of fibre optics located around the light reflecting surface whereby rotation of the light reflecting surface enables switching of a light source between one or more of the fibre optics.

The light reflecting surface can be a single or a double sided mirror. The mirror can be coated depending on the wavelength of the light to be reflected. The means for rotating the light reflecting surface can be an electric motor capable of continuously rotating the surface or can be a stepping motor allowing stepwise rotation of the surface.

The plurality of fibre optics are preferably located equidistantly from the light reflecting surface and are equally spaced apart.

The optical switch as hereinbefore described may form part of a detector/analyser system. The detector/analyser system comprises a light source, an optical switch as hereinbefore described and a detector and a sample cell whereby light from the light source may be passed through the sample cell, the light being appropriately switched by the optical switch and detected.

The invention will be illustrated and further described with reference to the accompanying drawings in which Figure 1 is a schematic plan view of an embodiment of the optical switch according to the present invention and Figure 2 is a section taken along the line II-II of the optical switch shown in Figure 1.

The optical switch illustrated in the drawings comprises a light reflecting surface 1, means 2 for rotating the light reflecting surface 1 about an axis 3 and means 4 for positioning the ends of a plurality of fibres 5 about the axis 3. The box indicated by the numeral 6 may be a light source or a light detector.

The light reflecting surface 1 may be, for example, a single sided or double sided mirror. By using a double-sided mirror, fibre optics may be arranged around a substantial portion of a full circle. Preferably, the mirror is front coated. The coating may be selected according to the wavelength of the light to be reflected e.g. gold for infra-red light or aluminium for white light.

Any suitable means 2 for rotating the light reflecting surface 1 may be used such as, for example, an electric motor. Preferably, a position indicator is associated with the light reflecting surface 1 or with the means 2 for rotating the surface 1. The position indicator may be used to provide a visual and/or electrical signal indicating the position of the light reflecting surface 1 relative to the fibre optics 5 and thus indicating the particular fibre optic 5 which is receiving or transmitting the light.

Known connectors may be used to position the fibre optics of the sensors (not shown) radially about the axis 3. Preferably, however, relatively short lengths of fibre optics 5 are fixed into the switch, and the fibre optics of the sensors may then be connected to the free ends of these relatively short lengths of fibre optics 5 by fibre to fibre connectors.

The optical switch according to the present invention may be used with any type of fibre optics such as glass fibres, fused silica fibres or liquid light guides. The fibre optics may be single fibres or bundles of fibres and may be two-channel bundles. It is also possible for more than one fibre or fibre bundle to be disposed at each radial position. For example, a flat beam or a plurality of light sources could be used to reflect light onto rows of fibre optics arranged at each radial position.

Generally, the optical switch will be used in association with a light source. By rotation of the light reflecting surface 1, light from a light source 6 may be reflected onto the end of any particular fibre optic 5. The light reflecting surface 1 may be continuously rotated in one direction thereby reflecting the light sequentially to each fibre optic 5 or may be continuously oscillated through a selected arc. Alternatively, the light reflecting surface 1 may be rotated stepwise, e.g. using a stepping motor. In this way a particular fibre optic may be selected. The light falling upon the end of a fibre optic 5 is transmitted along the fibre optic to the sensor (not shown). The fibre optics carrying the light from the sensors can all be connected to a single detector/analyser. Thus a single light source and a single detector/analyser may be used for a plurality of sensors.

More than one light source may be used. For example, if the fibre optics are connected to absorbance sensors, a reference light source, i.e. a source of light which is not absorbed by the sample, may be positioned alongside the source of light which is absorbed by the sample. The relative spacing of the light sources would give different angles of reflection. Thus, the light which is absorbed by the sample may be reflected onto one fibre while the reference light is reflected onto a second fibre while the light reflecting surface remains in the same position.

The optical switch may also be used in association with a detector. In this case, light is transmitted in the opposite direction i.e. along a fibre optic from a source (not shown) and reflected by the light reflecting surface 1 to a detector 6.

It is also possible to use the optical switch with a light source and a detector simultaneously. A light source and a detector may be positioned such that light from the light source is reflected onto the end

of a fibre optic of a sensor and light carried by another fibre optic from the same sensor is reflected by the light reflecting surface into the detector. Thus, a single detector/analyser, a single light source and a single optical switch may be used for a plurality of sensors.

CLAIMS

1. An optical switch comprising a light reflecting surface, means for rotating the light reflecting surface about an axis through the plane of the surface and a plurality of fibre optics located around the light reflecting surface whereby rotation of the light reflecting surface enables switching of a light source between one or more of the fibre optics.

2. An optical switch according to claim 1 in which the light reflecting surface is a planar mirror.

3. An optical switch according to claim 1 or claim 2 in which the rotating means is an electric motor.

4. An optical switch according to any of claims 1 to 3 in which the plurality of fibre optics are equidistant from the light reflecting surface and are equally spaced apart.

5. An optical switch according to claim 2 in which the planar mirror is double sided.

6. An optical switch according to any of the preceding claims in which the light reflecting surface is coated.

7. An optical switch according to any of the preceding claims in which the fibre optics comprise a single optical fibre or a plurality of optical fibres.

8. An optical switch according to any of the preceding claims comprising sensors or detectors for sensing or detecting the light received by the fibre optics.

9. An optical switch according to any of the preceding claims comprising means indicating the orientation or position of the light reflecting surface relative to the fibre optics.

10. An optical switch as hereinbefore described and with reference to the accompanying drawings.

11. A detector/analyser system comprising a light source, an optical switch as claimed in any of claims 1 to 10, a detector and a sample cell.

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